

SDMS Document



114267

NOTICE: If the film image  
is less clear than this  
notice, it is due to the  
quality of the document  
being filmed

Site Name : Endicott

~~W81~~ (End)

Site # : 542-11

END 002

0000114267

NOTICE: if the film image  
is less clear than this  
notice, it is due to the  
quality of the document  
being filmed

VILLAGE OF ENDICOTT  
BROOME COUNTY, NEW YORK

VINYL CHLORIDE CONTAMINATION  
at the  
RANNEY WELL

MARCH 1983



Prepared by:  
Eugene A. Kudgus, P.E.  
Superintendent of Public Works  
Village of Endicott, N.Y.

*Endicott  
Village  
Wellfield*

END 002

00008

F

## TABLE OF CONTENTS

1. SUMMARY AND RECOMMENDATIONS
  - 1.1. Summary
  - 1.2. Recommendations
2. INTRODUCTION
  - 2.1 Purpose
  - 2.2 Background
  - 2.3 Village Position
3. Existing System
  - 3.1 Service Area
  - 3.2 Wells
  - 3.3 Consumption
4. RANNEY WELL
  - 4.1. General
  - 4.2 Geology
5. VINYL CHLORIDE
  - 5.1 General
  - 5.2 Toxicology
  - 5.3 Guidelines
    - 5.3.01 American Water Works Association (AWWA)
    - 5.3.02 Environmental Protection Agency (EPA)
    - 5.3.03 New York State Department of Health
6. EFFORTS TO DATE
  - 6.1 Water Analyses
  - 6.2 Research
  - 6.3 Ranney Well Aeration
7. DATA EVALUATION/PLAN DEVELOPMENT
  - 7.1 Evaluation
  - 7.2 Plan Development and Implementation
8. FUTURE EFFORTS/OPTIONS
  - 8.1 Future Efforts
  - 8.2 Short Term Options
  - 8.3 Long Term Options
    - 8.3.01 Purge Well
    - 8.3.02 Treatment
    - 8.3.03 Long Term Items

### APPENDIX

END 002

00003

## 1. SUMMARY AND SPECIFICATIONS

### 1.1 Summary

In December 1982, the Village of Endicott was made aware of the presence of vinyl chloride in one of its main producing municipal wells, the Ranney Well ( Well #32).

In the time that has passed since the discovery of the problem, the Village has conducted intensive monitoring and sampling of the well, well laterals and points in the distribution system, performed investigations, analyzed data, purchased and installed aeration equipment, and developed a plan for exploratory well drilling and sampling.

Based upon data from the laboratory analyses, it is presently felt that the contamination source lies in an area to the west of the well probably between the well and the Nanticoke Creek. The Village has therefore developed and will soon implement a plan for exploratory well drilling and sampling in that area to the west of the Ranney Well.

Most recent laboratory analyses show vinyl chloride at the well to be 2 parts per billion. (N.Y.State "action level" guideline is 5 ppb.)

### 1.2 Recommendations

As a result of the efforts to date and based upon the information available, it is recommended that the Village;

END 002

00004

1.2 Recommendations cont.

1. Continue to operate the aeration equipment at the Ranney Well.
2. Continue monitoring the water produced at the well with weekly laboratory sampling and analysis.
3. Proceed with the plan developed for exploratory well drilling and analysis in the area west of the Ranney Well. (By letter received April 4, 1983, the New York State Dept. of Environmental Conservation has offered technical assistance in locating the source of the vinyl chloride. The D.E.C. offer will be discussed at a meeting to be soon scheduled.)

END 002

00005

2.

INTRODUCTION

2.1 Purpose

The purpose of this report is to present an overview of the efforts of the Village of Endicott to deal with the presence of vinyl chloride in the Village Ranney Well and to present recommendations for short and long term solutions to the organic contamination problem.

2.2 Background

Water surveillance samples collected in May 1981 by the E.P.A. first showed the presence of vinyl chloride in the Village of Endicott Ranney Well (Well No. 32). Subsequent sampling by the E.P.A. to confirm or disprove the presence of organic contaminants was conducted in July 1981, February, September, November and December 1982.

In summary, the results showed the occasional low level presence of certain volatile organic chemicals, the most prevalent of which was vinyl chloride.

Since the NYS Dept. of Health, Bureau of Public Water Supply has established an "action level" of 5 parts per billion (ppb) for vinyl chloride, it was recommended by the Bureau by letter of December 28, 1982, that the Village:

END 002

00006

## 2.2 Background cont.

1. Contract with a New York State Approved laboratory for collection and analysis of water from the affected well on a monthly basis beginning in January or February 1983
2. Retain a professional engineer to make recommendations for short and long term solutions to the problem.

## 2.3 Village Position

The Village of Endicott has maintained the position that it will continue monitoring the Ranney Well on a weekly basis and continue to make every possible effort to locate and remove the source of the vinyl chloride contamination.

END 002

00007

3.

EXISTING SYSTEM

3.1 Service Area

The Village of Endicott owns and operates a municipal water system serving a population of approximately 45,000 people. The municipal system serves not only the Village of Endicott, but the part-town areas of the Town of Union as well. General boundaries of the service area are; to the west, the Broome-Tioga County line; to the east, Robinson Hill Road; to the north, the Union - Maine Town line; and to the south, the Susquehanna River. A map showing the boundaries of the water system and its main producing wells is provided in the Appendix.

3.2 Wells

The Endicott Water Works obtains its entire supply of water from a number of wells located along the north shore of the Susquehanna River between Nanticoke Creek in Endicott and Davis Street in Endwell. These working wells, their locations, and capacities are as follows:

- Well No. 32 - The Ranney Well located on South Grippen Street in Endicott  
capacity: 6 mgd (million gals per day)
- Well No. 5 - Located on South Street in Endicott  
capacity: 3.7 mgd

END 0002

00008



### 3.2 Wells cont.

Well No. 28 - The Park Well, located two hundred  
feet east of Well No. 5  
capacity: 2 mgd

Well No. 30 - The Endwell Well, located opposite  
Davis Street in Endwell between the  
Susquehanna River and NYS Rte 17  
capacity: 1 mgd

As one can see from the preceeding, the Ranney Well is  
very important to the system in that its production  
accounts for 47% of the capacity of the working wells.

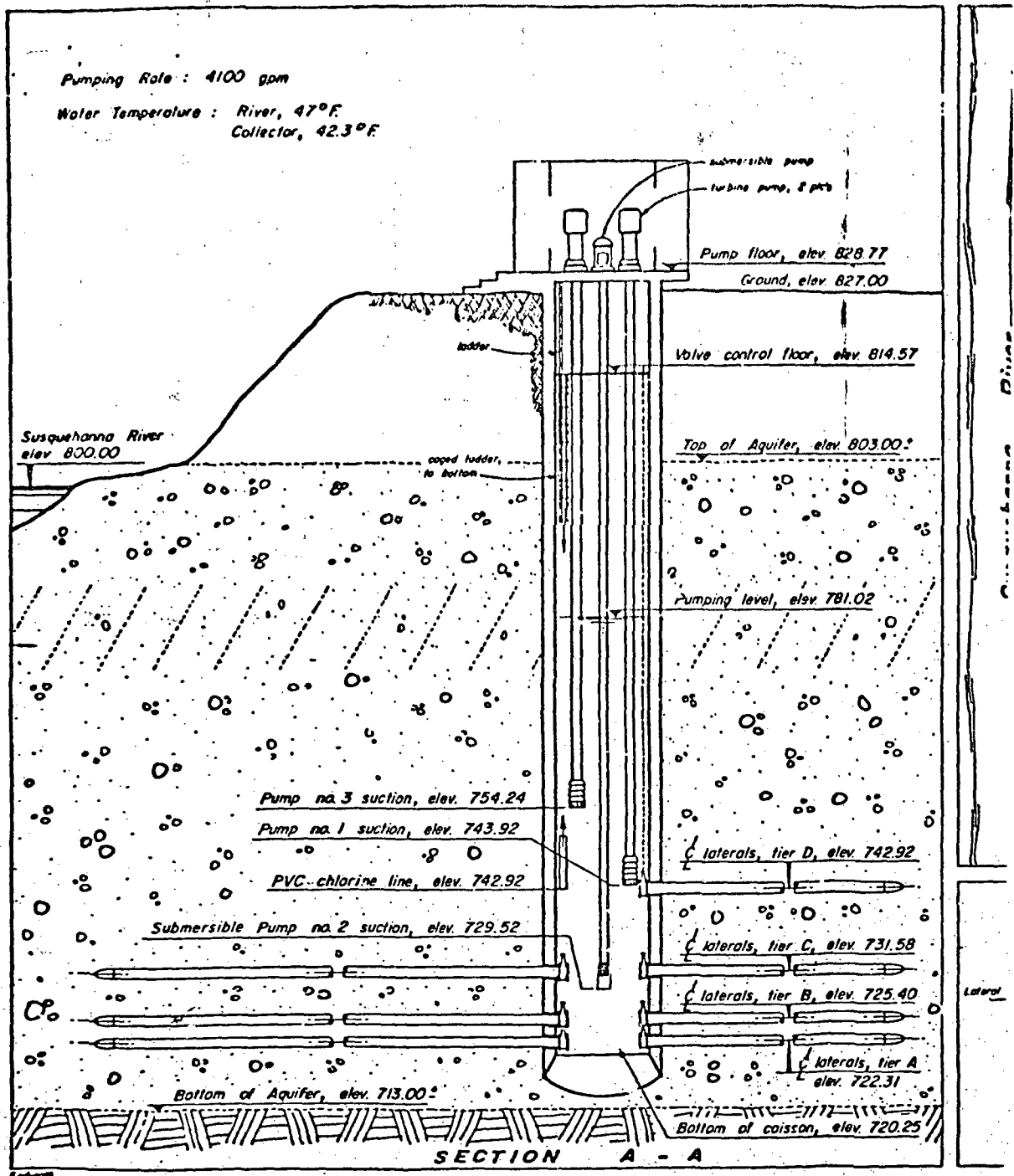
### 3.3 Consumption

The water produced at the wells and put into the dis-  
tribution system varies monthly from 6 mgd to 12 mgd,  
with the average annual production being approximately  
9 million gallons per day. Figures of past analyses  
show that industrial/commercial useage accounts for  
about 60% of the water (5.4 mgd) with the remaining  
40% (3.6 mgd) being consumed by residential customers.

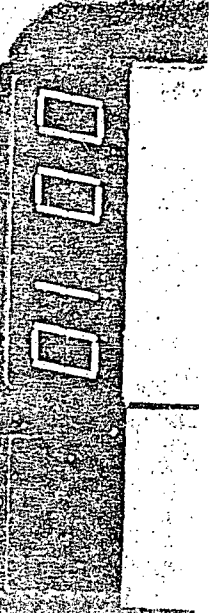
END 002

00009

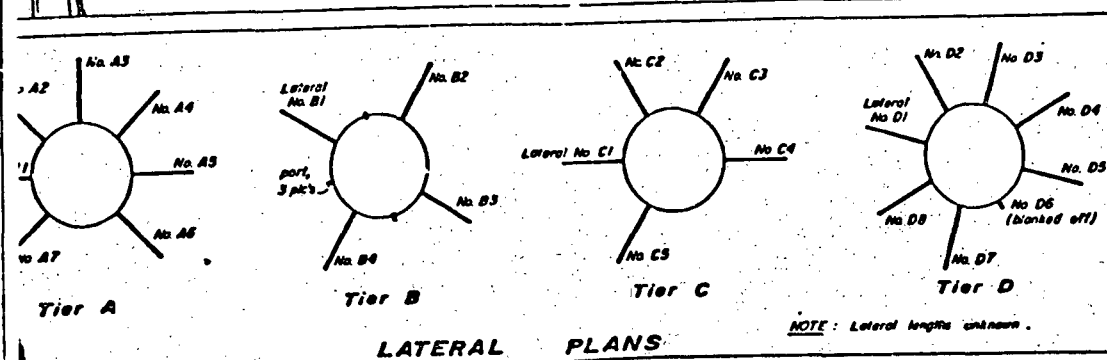
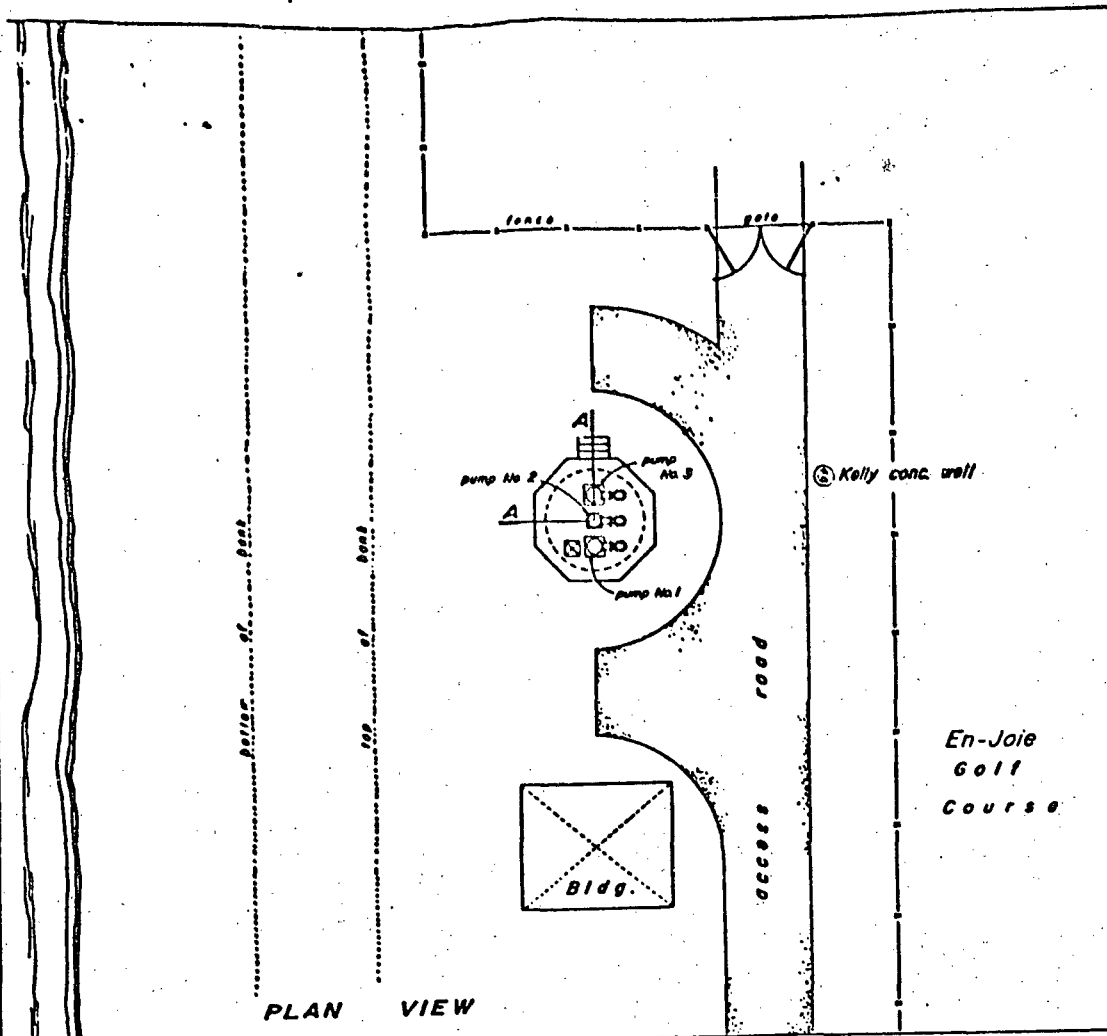
NOTICE: if the film image is less clear than this notice, it is due to the quality of the document being filmed



END 002



NOTICE: if the film image is less clear than this notice, it is due to the quality of the document being filmed



SECTION and PLAN VIEW of RANNEY WELL

END 002

4.

RANNEY WELL

4.1 General

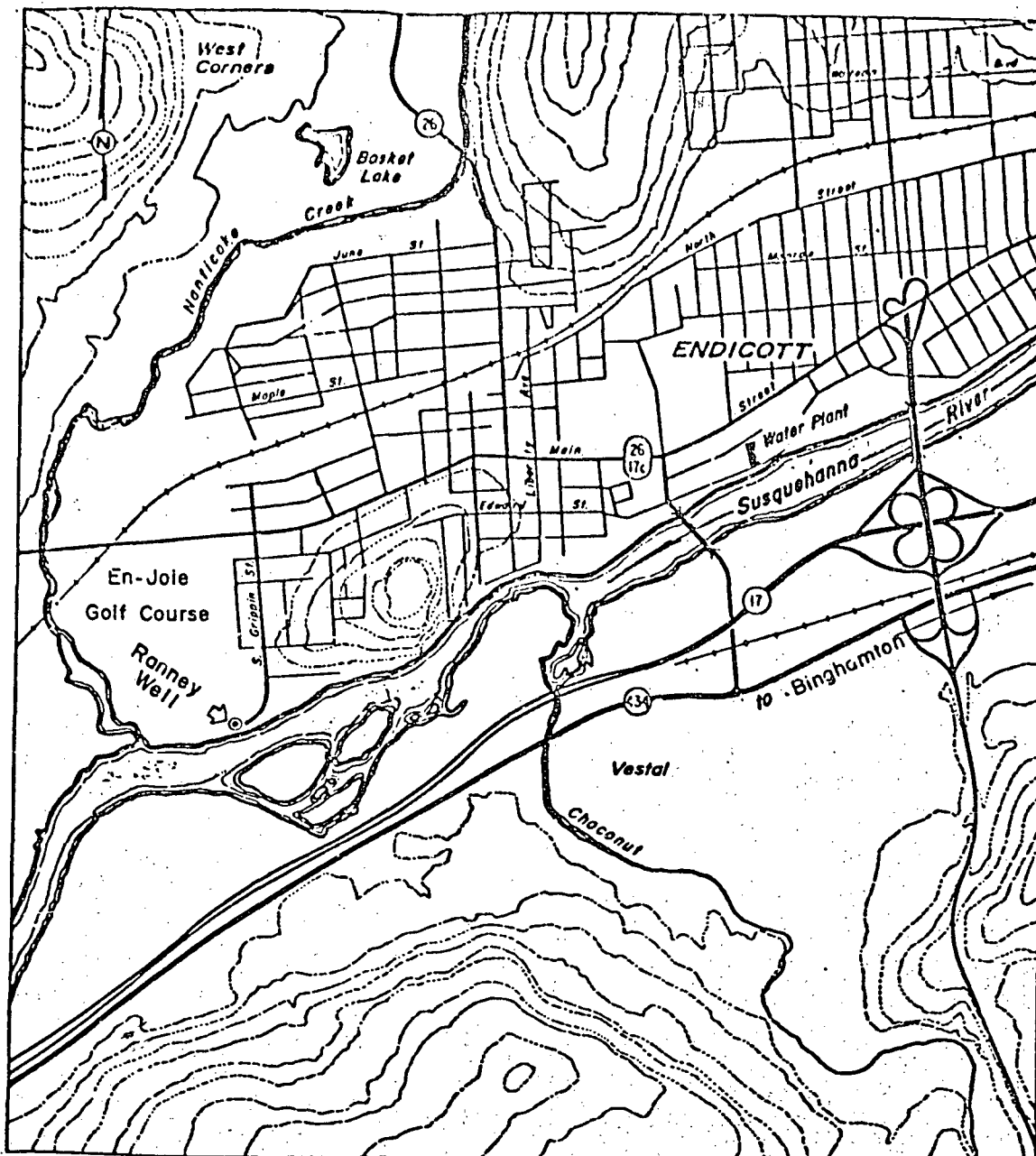
The Ranney Well, which supplies approximately 6 mgd of water to the Endicott Water Works, was installed in 1948 by the Ranney Water Collector Corporation of New York, a predecessor of the present day Ranney Company. The well is located at the end of South Grippen Street, adjacent to a golf course and park, approximately 100 feet inland from the Susquehanna River. The location of the well with respect to the surrounding area is shown on the drawing on the following page.

The well is 108.5 feet in overall length from the top floor slab to the bottom of caisson with an inside diameter of 13 feet. The top floor is approximately two feet above the existing ground level of 827± MSL. There are twenty-four, 8 inch diameter horizontal screens totaling a reported 900 lineal feet radiating from the central caisson in four tiers, as shown on the drawing following the Location Plan. The cross-sectional view of the well showing pertinent structural and physical elevations can also be seen on the same drawing. This well was first placed into operation in 1950 and has been operated continually since.

END 0002

0012

NOTICE: If the film image is less clear than this notice, it is due to the quality of the document being filmed.



RANNEY WELL GENERAL LOCATION PLAN.

END 002

0013

#### 4.2 Geology

A hydrogeological survey was conducted at the well site prior to construction to ascertain the feasibility of constructing a Ranney Collector Well. This survey determined that the lateral screens of a collector well at this site would be projected into a fairly uniform and coarse glacial outwash gravel, underlain by shale and partly consolidated hard clay. Test drilling revealed several layers of finer material to be present. However, as these layers did not appear at all the test holes, they were considered to be lenticular in shape. These layers of fine material apparently are non-continuous and do not greatly restrict aquifer recharge from the river, as shown by correlated responses of the water level in observation wells to changes in river level.

END 002

0014

5.

VINYL CHLORIDE

5.1 General

Vinyl chloride has been used for over forty years in producing polyvinyl chloride (PVC) which in turn is the most widely used material in the manufacture of plastics throughout the world. Of the estimated 18 billion pounds of vinyl chloride produced worldwide in 1972, about 25% was manufactured in the United States. Production of vinyl chloride in the United States reached slightly over 5 billion pounds in 1977. Production of vinyl chloride has risen nearly 14% annually between 1968 and 1973 as evidenced by the broad dependence of nearly every branch of industry and commercial activity upon products and components fabricated from polyvinyl chloride.

Vinyl chloride and polyvinyl chloride are used in the manufacture of numerous products in building and construction, the automotive industry, for electrical wire insulation and cables, piping, industrial and household equipment, packaging for food products, medical supplies, and is depended upon heavily by the rubber, paper and glass industries. Polyvinyl chloride and vinyl chloride copolymers are distributed and processed in a variety of forms

END 002

0015

### 5.1 General cont.

including dry resins, plastisols (dispersions in plasticizers), organosols (dispersions in plasticizers plus volatile solvent), and latex (colloidal dispersion in water). Latexes are used to coat or impregnate paper, fabric, or leather.

### 5.2 Toxicology

The majority of toxicological information on vinyl chloride comes from animal and human occupational exposures via inhalation. Short-term, high level ( $20 \text{ g/m}^3$ ) (grams per cubic meter) exposure to vinyl chloride gas can cause throat and lung irritation, intoxication, tiredness, abdominal pain, numbness and tingling of fingers and toes, pains in joints, coughing and sneezing. Chronic or long term exposure to relatively low levels of vinyl chloride (possibly below  $125 \text{ mg/m}^3$ ) (milligrams per cubic meter) can cause thickening of the skin on the back of the hands and lower forearms, bone and joint abnormalities, cardiovascular irregularities, and damage to the liver and spleen.

Vinyl chloride is mutagenic in a variety of bacterial test systems and there is sufficient evidence to classify this compound as a human carcinogen. In long term inhalation studies with animals, liver,

END 002

0016



## 5.2 Toxicology cont.

lung, skin, bone, mammary, kidney and brain tumors have been found; liver tumors have been reported in rats chronically exposed to as little as  $65 \text{ mg/m}^3$ . In humans, the inhalation of vinyl chloride during occupational exposure has caused liver and possibly lung cancer. Vinyl chloride was also carcinogenic in rats following chronic dosing via the oral route.

## 5.3 Guidelines

Although various agencies have set forth recommended limits or guidelines for vinyl chloride, no regulations have to date been established. A review of present guidelines follows.

### 5.3.01 American Water Works Association (AWWA)

The AWWA has submitted a statement to the U. S. Environmental Protection Agency on the Advance Notice of Proposed Rule Making on Volatile Synthetic Organic Chemicals (VOC's) in Drinking Water, which appeared in the Federal Register March 4, 1982. Regarding vinyl chloride, the AWWA recommended concentration levels corresponding to three categories of action.

- Category 1 - levels greater than 100 parts per billion - high concentrations and consequently greater risks. Immediate action is warranted to reduce contaminant level.

END 002

0017

### 5.3 Guidelines cont.

- Category 2 - levels between 10 and 100 parts per billion - intermediate concentration with lower risk. Prompt action is warranted to step up surveillance and consider control strategies. Action should reflect whether the concentration is at the higher or lower part of the range.
- Category 3 - levels less than 10 parts per billion very low concentration. Because little risk is associated with these concentrations, only routine monitoring is required.

#### 5.3.02 Environmental Protection Agency (EPA)

In the Federal Register notice of availability of draft ambient water quality criteria, EPA stated that it is considering setting criteria at an interim target risk level of  $10^{-5}$ ,  $10^{-6}$ , or  $10^{-7}$ . The level set for  $10^{-6}$  (1 chance in one million) is 51.7 parts per billion. This level is based on an exposure assumption of 2 liters of drinking water and 18.7 grams of fish consumed every day for 70 years. Other agencies have made recommendations to EPA for upper bound limit concentration of vinyl chloride in drinking water. The CAG (EPA Carcinogenic Assessment Group) recommends a limit of 20 parts per billion for a

END 002

00118

### 5.3 Guideline cont.

1 in 100,000 lifetime cancer risk. The NAS (National Academy of Sciences) projected the same 1 in 100,000 lifetime cancer risk at 10 parts per billion.

The limits of both agencies are based upon a consumption of 2 liters a day for 70 years by a 70 kilogram (154 lb.) adult.

#### 5.3.03 New York State Department of Health

The Department of Health, in the absence of federal or state standards for most organic chemicals in drinking water, is using, except for a few chemicals, the general guideline of 50 parts per billion for any one organic contaminant and 100 ppb for total organic chemicals. Where either level is exceeded at the tap, the department advises that water should not be used for drinking or cooking purposes.

In view of its carcinogenic potential, the Department of Health is currently recommending that water which consistently contains vinyl chloride at a concentration greater than 5 ppb not be used for drinking or cooking.

END 0002

000119

6.

EFFORTS TO DATE

Upon receiving notification of the presence of vinyl chloride, the village immediately undertook numerous steps towards the solution of the problem.

6.1 Water Analyses

Although the State Department of Health recommended monthly monitoring, the village set up a program of weekly testing and analysis. This testing included not only the Ranney Well, but points in the distribution system as well as other points that might have potentially been a source of the vinyl chloride. D.W. Friend Laboratory, a state certified lab in Waverly, New York, was retained by the village to perform this testing.

Among the many samples tested were samples taken from each lateral of the well. Richard Miller, Water Department Supervisor and a certified scuba diver, made several dives into the well to obtain the samples.

The Friends lab test results, as well as the New York State Department of Health lab results and the E.P.A. results are summarized in the Appendix.

As can be seen from the summary the most recent analyses at the well have indicated vinyl chloride at two parts per billion.

END 002

00020

## 6.2 Research

Extensive research was undertaken to learn about vinyl chloride; its manufacture, uses, composition, chemical and physical characteristics and its potential for removal through various means of treatment. A literature search was performed through the Denver Colorado offices of the American Water Works Association. Other information was obtained from the American Society of Civil Engineers library in New York City. Still more information on vinyl chloride was obtained from the Environmental Protection Agency (EPA) and the New York State Department of Health. Various meetings were held in January and February, 1983 with representatives of the village, the D.E.C., State and local Health Departments, and EPA for the purpose of gathering data and exchanging information on all aspects of the vinyl chloride situation.

## 6.3 Ranney Well Aeration

After the first meeting with the New York State Department of Health in Syracuse (Jan. 7, 1983), it was decided that the village would design and install aeration equipment at the Ranney Well as soon as possible. This was done with the intention that the installation of this equipment would be a short-term effort which would be in place while a long term solution was being developed.

END 002

00071

### 6.3 Ranney Well Aeration cont.

The equipment was designed such that a certain amount of purified air would be introduced into the bottom of the well and distributed via piping and diffusers to air-strip the vinyl chloride. Care was exercised in specifying the equipment since too much air could damage the existing pumps and piping, and produce other negative secondary effects. In the absence of any data available for air stripping vinyl chloride, it was decided that the design would provide for 1 to 2 parts per million of oxygen to be diffused into the water. The compressor was then sized accordingly.

The unit selected was an Ingersoll-Rand Model 5T2NLD7 Type 30 air compressor rated to deliver 26.5 scfm at 100 psig. Along with the non-lubricated compressor was specified a Delmonox 3K11 air purifier.

All equipment was installed by Water Dept. personnel. Mr. Miller was once again required to obtain scuba equipment and dive into the well to secure the system piping and diffusers.

All equipment was installed and working by March 9, 1983. Since levels of vinyl chloride are remaining at the 2 ppb range and efforts are being concentrated on source location through well drilling, the present aeration equipment will be kept in place without further modification or performance evaluation.

END 002

00000000

## 7. DATA EVALUATION/PLAN DEVELOPMENT

### 7.1 Evaluation

Samples taken from contributing laterals within the Ranney Well showed that the presence of vinyl chloride was most prevalent in the uppermost tier, in laterals D-2 and D-3. Levels of the chemical in these two laterals ranged from 10 to 20 ppb. Since the other laterals were able to contribute "clean" water, the effects of dilution were such that total vinyl chloride from the well was still at two and three parts per billion. Even so, as soon as it could be accomplished, the two laterals were valved shut.

The presence of vinyl chloride in these two laterals at such relatively high concentrations and the fact that the other test results were either non-conclusive or failed to indicate other potential sources or contributing areas, has caused attention to be directed to that area directly west of the Ranney Well from which laterals D-2 and D-3 draw water.

### 7.2 Plan Development and Implementation

Field Survey work has just been completed in the area to the west of the Ranney Well. Topography, cross-sections and elevations have been obtained and drawings are now being prepared. These drawings will be the basis of a plan developed by the Village that calls

END 002

00023

7.2 Plan Development and Implementation cont.

for systematic well drilling and water sample analysis. It is intended to locate the test wells three at a time, drill, obtain soil samples, test the water obtained, and by triangulation drill additional wells as necessary to converge on the source.

Specifications for the well drilling have been prepared by the Village and we will soon advertise for bids for this work.

END 002

00274



8. FUTURE EFFORTS/OPTIONS

8.1 Future Efforts

Until such time as the vinyl chloride problem is resolved, the village will continue with weekly monitoring and testing of the Ranney Well. Additionally, the village will continue its efforts to locate and eliminate the source of contamination.

8.2 Short Term Options

In the event that the weekly testing indicates rising levels of vinyl chloride, the village could substantially reduce the output of well and request residents and industry to conserve water as much as possible. As long as the levels continue to be consistently below 5 parts per billion, this will not be necessary.

If the situation deteriorates, depending on the levels of vinyl chloride detected, it might be necessary for the County to issue a boil water notice to those areas supplied by the well.

8.3 Long Term Options

If the source of the vinyl chloride cannot be specifically determined the following options would be considered.

END 002

0025

### 8.3 Long Term Items cont.

#### 8.3.01 Purge Well

It is possible that the test well showing the highest concentrations of contamination could be developed into an intercepting well, which would be pumped to waste. This could have the effect of reversing the direction of travel of the chemical away from the Ranney, and then eventually removing it from the aquifer by continuous pumping. Depending on the results and success of the exploratory drilling, this could become a short term option.

#### 8.3.02 Treatment

Another option that could be implemented would be the design and construction of a sophisticated on-site treatment facility. (As mentioned previously, the aeration equipment presently in place is intended to be a short term, temporary installation). A permanent treatment facility might consist of unit processes such as diffused air aerators, packed tower or redwood slat aeration, spray aeration, or adsorption on granular activated carbon. Because aeration is the least expensive alternative, and also because vinyl chloride is relatively easy to air-strip, aeration will likely be the first process considered.

END 002

00026

### 8.3 Long Term Items

#### 8.3.03 Shut Down of Ranney Well

If all the above fails to produce a safe quality drinking water, it will be necessary to close the well and work towards the location and development of a new source of potable water. However, due to the potential for source removal or at least interception of the contamination, and the technology available today for treatment, it is felt that the chances of being forced to use this alternate are extremely remote.

END 002

0027

NOTICE: If the film image  
is less clear than this  
notice, it is due to the  
quality of the document  
being filmed

APPENDIX

END 002

00020

NOTICE: If the film image is less clear than this notice, it is due to the quality of the document being filmed

Parts per Billion  
Vinyl Chloride

Date of Sample	Locations	Laboratory		
		D.W. Friend	NYS Health Dept.	EPA
5/11/81	Ranney Tap			8.4
2/23/82	Ranney Tap			7.5
"	Robble Ave.			5.6
"	Well # 28			1.6
9/29/82	Ranney Tap		1	
"	Well #28		1	
11/9/82	Ranney Tap		3	
"	Robble Ave.		2	
"	Well #28		1	
"	Bates Troy		1	
12/13/82	Ranney Tap		3	
"	Robble Ave.		3	
"	Well # 28		1	
"	Bates Troy		1	
1/7/83	Ranney Tap	6.3		
"	Boswell Hill	4.4		
1/18/83	Ranney Tap	9.0	3	
"	Ranney Test Well	4.0		
"	South St. Storm Dr.	ND		
"	Kelly Well	4.0		
"	Bates Troy	ND	1.0	
"	Well #28	2.0	1.0	
"	Robble Ave.	7.0	1.0	
"	Boswell Hill	8.0	1.0	

\* - verbal  
ND - non-detectable

END 002

0029

VERIFIED TEST RESULTS

Parts per Billion  
Vinyl Chloride

Date of Sample	Locations	Laboratory		
		D.W. Friend	NYS Health Dept.	EPA
1/25/83	Ranney Tap	4		
"	911 Neal Rd w/aerator	1		
"	911 Neal Rd w/o aerator	2		
"	Boswell Hill	3		
"	Robble Ave.	4		
1/27/83	Ranney Tap	ND	2	
"	A-7	ND	ND *	
"	B-2	ND	1.0 *	
"	B-4	ND	No Sample	
"	C-1	5	6 *	
"	Robble Ave.		1	
"	Well #28		ND	
"	Bates Troy		ND	
"	Boswell Hill		1	
2/3/83	C-2	ND		
"	C-3,4,5, D-1	ND		
"	D-2	17		
"	D-3	17		
"	D-4	2		
"	D-7	ND		
"	D-8	ND		
"	Ranney Tap	2		
2/8/83	Ranney Tap	2		
2/17/83	Ranney Tap	3		
"	Nanticoke Creek	ND		
"	D-7	ND		
"	D-8	1		
"	C-2	3		

\* - verbal  
ND - non-detectable

NOTICE: If the film image is less clear than this notice, it is due to the quality of the document being filmed

END 002

0030

Parts per Billion  
Vinyl Chloride

# END OF

\* - verbal  
ND - non-detectable